CHASSIS LUBRICATION

VOLUME VII • NUMBER 6 SEPTEMBER, 1943

Eleventh Annual Meeting

NATIONAL LUBRICATING GREASE INSTITUTE

Edgewater Beach Hotel

Chicago, Ill.

November 1, 2, 3, 1943

Members and Guests cordially invited for all sessions and banquet.

An excellent program of speakers has been arranged covering Technical matters and subjects of immediate concern to the Grease Manufacturer.

Be sure to make your hotel reservations early.
Contact Edgewater Beach Hotel direct . . .

Survey of Lubricating Grease Test Methods

By CARL W. GEORGI
Chairman, Technical Committee, National Lubricating Grease Institute

(Continued from August Issue)

SEPARATION (Bleeding)

Separation of free oil from grease, commonly called "bleeding," has long been a source of controversy. Although a limited amount of oil bleeding is not harmful in the great majority of applications and in some cases may even be desirable, consumers tend to demand bleed-free greases and numerous specifications have itemized test methods to achieve this end.

Table 12 lists separation test methods which are typical of those used in past years. Recently, however, the porous cone type of bleeding test has come into prominence through its use in a number of government grease specifications. Table 13 lists the various test conditions reported as being in use with both the 60 mesh wire screen cone and the nickel filter cone.

Due to the current prominence of the cone type bleeding test a brief investigation was made in connection with this survey. Figure 14 shows bleeding test results using the 60 mesh wire screen cone on a series of calcium base cup greases. As indicated, oil separation from calcium base greases is largely a function of grease consistency. At a test temperature of 180°F. all of the calcium base greases softer than No. 4 showed extremely high rates of apparent bleeding. Due to the fact the test temperature approached quite closely the actual grease melting points, the results were actually a combination of oil separation plus melting of the grease and flowing through the cone.

At a test temperature of 150° the heavier consistency calcium grease showed fairly low separation, whereas the softer grades had quite high rates. At 120°F. all grades of the calcium greases showed satisfactorily low rates of separation.

Figure 15 shows a series of 60 mesh screen cone separation tests on three different No. 3 grade soda-base greases. These greases varied as to the viscosity of the mineral oil constituent. Greases A and B were milled products, whereas C was unmilled. At a test temperature of 210°, grease A was the only product having what might be termed satisfactory bleed resistance by the cone test. The high viscosity mineral oil constituent plus the milling apparently account for this behavior. Greases B and C showed very high rates of oil separation in the tests at 210° which can probably be accounted for by the lower viscosity of the mineral oil constituent and the lack of milling in the case of grease C.

The tests at 150° and 180° follow the same general order and in the case of soda-base greases it would appear that important factors in minimizing bleeding are viscosity

(Continued on Page 4)

TABLE 12

SEPARATION (Bleeding) TESTS

Sample in 5# can with cupped surface, stored for one week at 120° F.

Sample in can with cupped surface, stored for 1 to 12 months at room temperature.

Sample heated to 200° F. for ½ hour in beaker.
(Army Spec. 2-39-C)

Sample heated to 212° F. for 18 hours in Pour Test Tube.
(Air Corps Spec. 3560-E)

Sample heated to 140° F. for 24 hours in Pour Test Tube.
(Air Corps Spec. 3588-A)

TABLE 13

CONE SEPARATION (Bleeding) TESTS

60 Mesh Screen Cone Tests:

24 Hrs. at 120° F.
24 Hrs. at 150° F.
24 Hrs. at 160° F.
48 Hrs. at 160° F.
144 Hrs. at 160° F.
24 Hrs. at 210° F.
50 Hrs. at 212° F. (Spec. AN-G-3)

Nickel Filter Cone Tests:

50 Hrs. at 120° F.
50 Hrs. at 150° F. (Navy Spec. M-484)
(Ordnance Spec. OD Grease No. 0)
24 Hrs. at 160° F.
(Air Corps Spec. 3581-B)
50 Hrs. at 160° F.
48 Hrs. at 175° F.
50 Hrs. at 210° F.
200 Hrs. at 275° F.

FIGURE 14

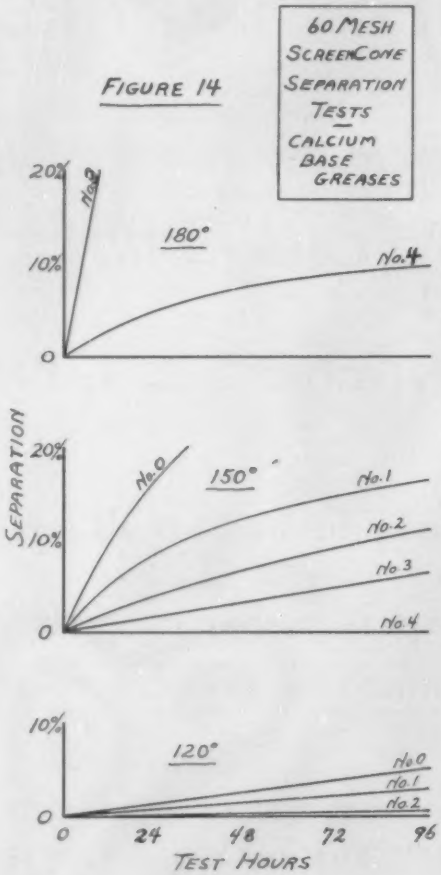
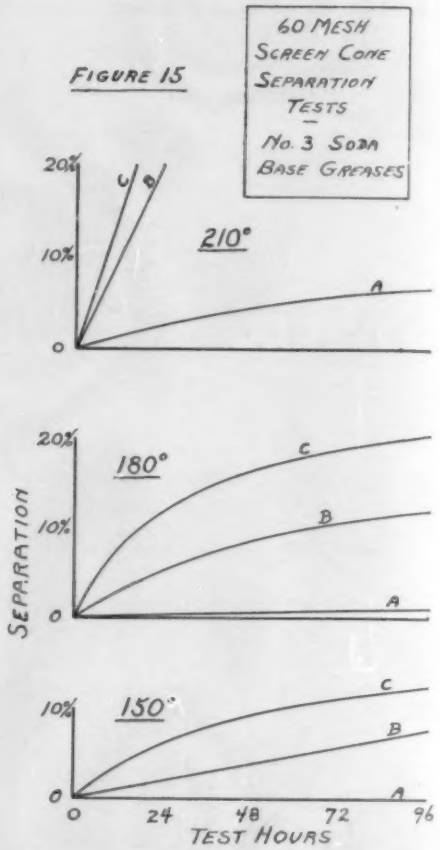


FIGURE 15



The INSTITUTE SPOKESMAN

Published monthly by

THE NATIONAL LUBRICATING GREASE INSTITUTE

GEORGE W. MILLER ..... *Editor*

498 Winspear Ave., Buffalo 15, N. Y.

Associate Editors

J. R. Battenfeld — W. H. Oldacre

M. B. Chittick — W. H. Saunders

E. V. Moncrieff — H. G. Vesper

OFFICERS

President: C. B. KARNS, Standard Oil Co.
Vice-Pres.: WM. H. OLDACRE, D. A. Stuart Oil Co.
Treasurer: E. V. MONCRIEFF, Swan-Finch Oil Corp.
Executive Secretary: G. W. MILLER, Battenfeld Grease & Oil Corp. of N. Y.

DIRECTORS

J. R. BATTENFELD, Battenfeld Grease & Oil Corp.
F. C. KERNS, The Texas Co.
WM. H. SAUNDERS, JR., International Lubricant Corp.
M. R. BOWER, Standard Oil Co. of Ohio
SYDNEY BEVIN, Fiske Bros. Refining Co.
B. C. VOSHELL, Socony-Vacuum Oil Co., Inc.
L. P. LOCHRIDGE, Sinclair Refining Company
W. G. CLARK, Pure Oil Company
J. R. CORBETT, Cato Oil & Grease Co.
GEO. L. NEELEY, Standard Oil Co. of California
R. H. PATCH, E. F. Houghton & Co.
CARL W. GEORGI, Enterprise Oil Co.

TRADE ITEMS OF INTEREST TO OIL MEN

A recent issue of *Bus Transportation* carried an article on women bus drivers. It is on the experience of Pacific Greyhound employing 400 women drivers, covering employment, and training methods.

Bureau of Mines, Motion Picture Films, 1943, a catalogue of silent and sound pictures suitable for educational meetings. Films may be obtained without rental charge, the borrower paying transportation costs both ways, communication costs, and wear and tear if film is damaged. Films are distributed from the Bureau of Mines office at Pittsburgh and from sub-distribution centers listed in the catalogue.

Silent films are available giving the story of gasoline, of storage batteries, of spark plugs, of lubrication, of the internal-combustion engine, of valves, of automotive lubrication, and on the evolution of the oil industry.

Titles of sound films are "Diesel—The Modern Power," "The Story of a Spark Plug," "Lubrication," and "Petroleum and Its Uses." A complete list and description of films available may be had for the asking.

Transmissions, Differentials . . . .

Gear Cases on Passenger Cars, Trucks Are Self Containing and Carry Own Lubrication System

By J. HOWARD PILE

CHEK-CHART Editorial Director

Transmissions and differentials of passenger cars and trucks not only are self contained but they carry their own lubrication system right in the metal housing that also serves to keep out the dust and the dirt.

Both of these units are so designed that when the lubricant level is maintained at the lower edge of the filler plug hole, then lubrication will be adequately taken care of for the period of time or miles recommended by the manufacturer. That is, providing the recommended grade and type of lubricant is used as called for.

In the case of the differential, the filler plug hole is located in the side of the case. When the lubricant level is properly maintained, the ring gear will dip into the lubricant far enough under running and standing conditions that it will carry this lubricant up and over. This will lubricate the teeth of the ring gear, the teeth of the pinion gear, be splashed over the small gears of the differential itself and also over the antifriction bearings on both sides of the differential. In addition, lubricant will be carried out along the drive shafts in both directions to take care of the lubrication of the wheel bearings if they are of the type that get their lubricant from the differential housing.

There are yet other parts to be lubricated in the housing including the pinion shaft bearings and in the case of certain designs of trucks, the double reduction gears. Some of these obtain their lubrication from pockets into which the lubricant is splashed.

A good many differential housings can be drained through a drain plug located at the lowest part of the housing. However, some housings are not provided with drain plugs and in such cases it is necessary either to remove one of the cap screws at the bottom of the housing or to withdraw the lubricant by means of a suction device of some sort.

Transmissions are also provided with filler plugs which also automatically act as level plugs. All transmissions have drain plugs. In some trucks where the capacity is quite large, there may be two different level plugs, one for summer temperatures and one for winter temperatures.

WHAT CAPACITY?

It is convenient and sometimes necessary to know in advance what the capacity of the transmission and differential come to in order to quote a price. All lubrication charts provide this information. It is given in the tabulation of capacities and recommendations near the top of the chart. For those charts to be used in the United States, the capacity of the transmission and differential is given in pints or pounds where the lubricant recommendation is for any type of gear lubricant. This is because gear lubricant is measured and dispensed in the United States in either pints or pounds and a pint of gear lubricant is exactly equal to a pound.

Where the recommendation of lubricant for the unit is motor oil, the capacity is given in pints because motor oil is always dispensed by the pint or quart and not by the pound.

For those charts to be used in Canada or wherever Imperial measure is used, the capacity of the transmission and differential is given as pounds which are equal to the pounds used in the United States. That is, where the recommendation is for gear lubricant. The Imperial pint is one-sixth larger than the pound. Where the recommendation is for motor oil, then the capacity is given in Imperial pints.

These capacities are carefully worked out by the manufacturers and are on the basis of a refill capacity on the assumption that all the old lubricant has been drained from the unit. If the weather is cold or if the lubricant is thick, then the housing will not be completely emptied and it will not be possible to install the full amount of lubricant as indicated on the chart. It is quite usual in cold weather for a gear case that should hold 6 pts. or lbs. to take 1 pt. or lb. less. Flushing or the application of heat will result in more complete draining.

The correct working level is to bring the lubricant to the lower edge of the filler plug hole or level hole or about ⅜ in. below. The level should never be maintained above the lower edge of the hole. All excess lubricant should be allowed to drain out before replacing the plug. Any excess of lubricant in the case causes increased heat from the churning of the lubricant, causes air bubbles to form in the lubricant which may result in foaming and the excess lubricant may be forced out to places where it will do considerable harm such as on the brakes.

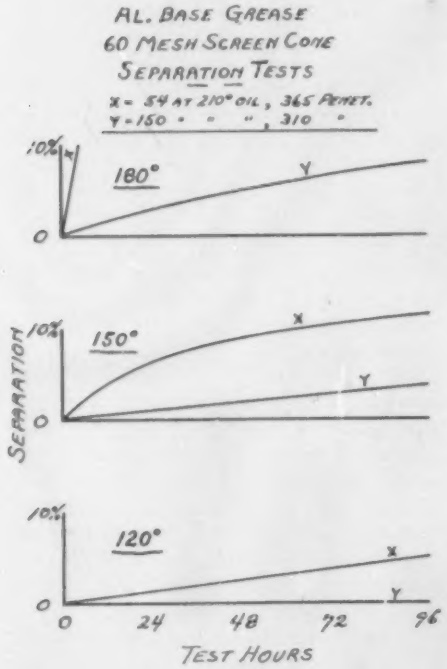
The principles of construction, operating conditions and more complete information regarding the lubrication of transmissions and differentials is to be found in the SERVICE MAN'S GUIDE to Automotive Lubrication.

(Continued from Page 2)

of the mineral oil constituent and milling. Consistency also plays an important part in separation tests on soda-base greases and follows the same general trend as with the calcium base greases.

Figure 16 shows separation test results with two aluminum base greases, one containing a very heavy mineral oil, the other quite a light oil. Here again, the effect of oil viscosity on bleeding is markedly apparent and in the case of Grease X it will be noted that test temperature has a very marked effect on the rate of bleeding.

FIG. 16



A number of tests were made to compare the perforated nickel cone with the 60 mesh wire screen cone. It was found that most greases showed slightly lower bleeding values when tested in the nickel filter cone than when tested in the screen cone, although the results were in the same relative order.

A number of laboratories have reported that cone bleeding tests do not appear to correlate satisfactorily with actual storage tests. A further objection has been raised that cone bleeding tests run at elevating temperatures may induce chemical or physical changes in greases which may produce separation values at considerable variance with results secured in actual storage conditions. If lime base greases are tested at too elevated temperatures they may of course melt and flow through the porous cones. If aluminum base greases are tested at temperatures approaching their melting points, they may undergo physical changes and develop the familiar rubbery consistency and show little or no bleeding, even though such greases might be susceptible to appreciable oil separation at more moderate temperatures.

The subject of bleeding tests is receiving further study by the Technical Committee of the N.L.G.I. and will be reported at a later date.

Corrosion Tests

Practically all grease specifications contain as a requirement, the so-called Copper-Strip Corrosion Test.

Table 17 lists Copper-Strip Tests which appear in many current grease specifications. Copper-Strip tests on greases when run for relatively short time intervals, evaluate only the presence or absence of active sulphur, and do not give any appreciable indication of true corrosiveness as might be induced by low molecular weight acids or other oxidation and deterioration products. Short-time Copper-Strip tests therefore seem to be of questionable usefulness, since free or active sulphur in greases or in mineral oils is practically non-existent, except in those cases where it is purposely added to impart extreme pressure properties.

TABLE 17

Copper Strip Corrosion Tests

24 Hours at Room Temperature	(FSB #530.4)
24 Hours at 140° F.	(Air Corps & Army)
3 Hours at 212° F.	(FSB—530.31)
5 Hours at 212° F.	(A.S.T.M. D-117)
18 Hours at 212° F.	(Air Corps & Army)
24 Hours at 212° F.	(AN-G-3)
10 Minutes at 250° F.	
1 Hour at 300° F.	
168 Hours at 150° F.	
6 Hours at 210° F.	
	in Norma-Hoffman Bomb

Some interest is developing in the use of the Norma-Hoffman Bomb as a means of evaluating corrosive tendencies of greases with particular reference to corrosion as may be induced by low molecular weight acids and other deterioration products. It seems important, however, to stress the fact that short-time Copper Strip tests serve only to indicate the possible presence of active sulphur in greases and that any attempt to evaluate true corrosion must involve either a much longer test time or a test under accelerated oxidizing conditions.

Water Determination

Table 18 lists the two test methods in current use for the estimation of water content of greases. A.S.T.M. Method D-128 involving distillation with Xylol is the standard method for the determination of water in greases. However, a great many laboratories and many grease specifications are still

FISKE BROTHERS REFINING CO.

Established 1870

★

NEWARK, N. J.

TOLEDO, OHIO

★

Manufacturers of

LUBRICATING GREASES

"Business is Ingreasing"

BATTENFELD GREASE & OIL CORP.

KANSAS CITY, MO.

MINNEAPOLIS, MINN.

N. TONAWANDA (Buffalo) N. Y.

•

Manufacturers of

BAT'S GREASES

exclusively for Refiners and the Jobbing Trade

TABLE 18
WATER DETERMINATION

Test Method	*Description*
Distillation with Xylol	A.S.T.M. Standard Method for Analysis of Grease D-128
Distillation with Naphtha	A.S.T.M. Standard Method of Test for Water in Petroleum Products. D-95

TABLE 18A
WATER DETERMINATION

	ASTM D-95 (Naphtha)	*ASTM D-128* (Xylol)
No. 1 Cup Grease	1.0%	1.5%
No. 3 Cup Grease	1.3%	1.8%
No. 4 Cup Grease	1.8%	2.2%
No. 1 Aluminum Base	Trace	.2%
No. 3 Soda Base	.3	.8%
No. 3 Soda Base	Trace	.3%
Oil plus 1% Water plus 1% Glycerine	1.0%	1.2%

using A.S.T.M. Method D-95, involving distillation with naphtha. Unfortunately, these two test methods may produce test results at considerable variance with each other. Table 18-A tabulates a series of results secured by testing a number of greases by the two A.S.T.M. methods. As shown, Method D-128, utilizing Xylol, produces consistently higher results than Method D-95 using naphtha. Due to the high boiling point of Xylol, it appears that Method D-128 distills out part of the glycerine contained in greases made from whole fats, so that the indicated percentage of water is really water plus glycerine.

The discrepancy between the two test methods may become a source of controversy in the case of soda-base greases of the anhydrous type, wherein specifications call for "trace of water." In many instances, soda-base greases which are substantially anhydrous and which show nil or trace of water by the D-95 method, may readily show as much as .3% or .4% indicated water by Method D-128, this indicated water actually being glycerine.

INSOLUBLE IMPURITIES IN GREASES

Table 19 lists test methods in current use for the determination of insoluble impurities in greases. Considerable work has been done with optical methods for making dirt counts. However, the difficulty in securing suitable microscopes and attachments has limited this work to a relatively few laboratories. The most widely used method for impurities is the determination of insolubles in hydrochloric acid and petroleum ether as per A.S.T.M. method D-128. This method, however, has the disadvantage that any free alkali, carbonates, etc., in greases, are converted to soluble salts so that only such matter as silica or sulfate salts are determined as the insolubles. It is the general experience that this method gives insoluble values considerably lower than may actually exist in many greases. An interesting method for determination of insoluble impurities is that utilizing Butyl Carbitol. Table 20 lists comparative results obtained on four greases "insolubles in HCI and ether" and the insolubles in Butyl Carbitol. As shown, the Butyl Carbitol insoluble values are much higher than the HCI-Ether insolubles.

TABLE 19
TESTS FOR IMPURITIES AND INSOLUBLES

Dirt Count at 60X Magnification (AN-G-3)
Dirt Count at 10X Magnification.
Dirt Count at 12X Magnification.
Insoluble in Butyl Carbitol.
Insoluble in HCI and Pet. Ether.
(A.S.T.M. D-128 and FSB #541.2)

LOW TEMPERATURE TESTS

Tests to evaluate the low temperature mobility characteristics of greases have attained great importance and the method most widely used at the present time is the Ball Bearing Torque Test apparatus. Table 21 lists using both the A.S.T.M. method D-128 for the low temperature test methods reported in current use. Other than for some use of the A.S.T.M. Penetrometer at low temperature, practically all methods relate to the Ball Bearing Torque Test Apparatus.

Cooperative work by a small number of laboratories has indicated rather poor agreement in test results with the Ball Bearing Torque Tester. Any kind of test at very low temperatures involves considerable difficulty and it would appear that the details of apparatus construction and test procedure

(Continued on Page 6)

CORRECT
LUBRICATION
since **1866**

SOCONY-VACUUM OIL COMPANY, INC.

26 BROADWAY NEW YORK, N. Y.

A GREASE FOR TEMPERATURES FROM 400° F TO -90° F

Greases made with lithium stearate now operate effectively over temperature ranges never before approached. This, a great wartime advantage, will, it is believed, have far-reaching effects on the greases of the future. Now is the time to prepare for post-war developments. Your inquiries are invited.

Foote
MINERAL COMPANY
A Step Ahead in Industrial Ores and Chemicals

PHILADELPHIA • ASBESTOS • EXTON • PENNSYLVANIA
HOME OFFICE: 1609 SUMMER STREET, PHILADELPHIA, PA.

TABLE 20

IMPURITIES IN GREASES

	A.S.T.M. D-128 Insoluble in HCl and Ether	*Insoluble in Butyl Carbitol*
No. 0 Cup Grease	.11%	.34%
No. 1 Cup Grease	.07%	.20%
No. 4 Cup Grease	.12%	1.05%
No. 3 Soda Base	Trace	.12

NOTE: The Butyl Carbitol method for determining non-oleaginous impurities in greases cannot be used with Aluminum or Lithium base greases, since these soaps are insoluble in this solvent.

TABLE 21

LOW TEMPERATURE TESTS

Army AXS-781, Grease OD No. 0

#204 Ball Bearing — Cold Torque Tests at −40°.

AN-G-3

#204 Ball Bearing — Cold Torque Test at −67° F.

Navy M-484

#204 Ball Bearing — Cold Torque Test at −50° F.

A.S.T.M. Penetrations at Low Temperatures

TABLE 22

A.S.T.M. PENETRATIONS AT LOW TEMPERATURES

Calcium Base Grease	77°	0°	−20°	Grease Gun Pumpability at 0° F.
200 Sec. Oil	390	320	305	Good
500 Sec. Oil	385	310	295	Poor

STEEL DRUMS—PAILS
—for oil, grease and other petroleum products
The substantial construction and perfect sealing closures prevent danger of loss or damage to contents during shipment. Made with a wide variety of spout openings and head designs including the E-Z seal level locking ring cover. Special tested linings provided for high test aviation gasoline and many other sensitive products. Complete manufacturing facilities located at four convenient shipping centers • Chicago • Jersey City • New Orleans • Richmond, California.
3 to 55 GAL.
INLAND STEEL CONTAINER CO.
Formerly WILSON & BENNETT MANUFACTURING COMPANY
6532 S. MENARD AVE. CHICAGO, ILLINOIS
Plants at Chicago—Jersey City— New Orleans—Richmond, Calif.
CONTAINER SPECIALISTS

(Continued from Page 5)

must be standardized much more specifically than they are at the present time if test reproducibility is to be satisfactory. A Joint Committee of the N.L.G.I. and the Annular Bearing Engineers is studying low temperature torque tests in an attempt to standardize a procedure which will give more uniform and consistent results than appear to be obtainable at present.

Table 22 shows A.S.T.M. Penetrations on two greases run at the standard temperature of 77° F. as well as at 0° and −20° F. Although the two greases had substantially identical penetration readings throughout the test temperature range, the one grease was found to have satisfactory pumpability in grease gun equipment at 0°, whereas the other grease was found to have quite poor temperature handling characteristics. These data are included to illustrate that penetration values do not offer a satisfactory means for evaluating low temperature mobility characteristics of greases and that some apparatus such as the Ball Bearing Torque Tester or the Pressure Viscosimeter will have to be developed further for this purpose.

CONCLUSIONS

The survey of lubricating grease test methods serves to emphasize the great need for closer cooperation between grease laboratories in the development of test methods. The lack of cooperative work of this nature over the past years has resulted in a tremendous variety of grease test methods, many aiming toward the same end, but resulting at the present time in a tremendous amount of duplication and confusion.

The future activities of the Technical Committee of the N.L.G.I. may well be centered around the improvement of the present unsatisfactory test method situation and the following four items are listed as deserving attention:

(1) Standardization of test methods within the grease industry.

(2) Promote the use of standardized test methods by grease consumers, particularly those

SHIPPING CONTAINERS
FOR ALL LUBRICANTS

•

The Draper Manufacturing Co.
Cleveland, Ohio

who purchase grease on specification.

(3) Development of improved standardized test methods.

(4) Development of the Pressure Viscosimeter for extending the knowledge of mobility characteristics of greases.

SAE Proposes Procedure To Conserve Anti-Freeze

The 1943-44 anti-freeze season is off to an early and lively start. The War Production Board ushered in the season with an order prohibiting further use by civilians of permanent type anti-freeze solutions.

The Society of Automotive Engineers made further news by pointing out that the order would encourage thousands of motorists to throw out remnants of last winter's permanent type anti-freeze, thus creating a strain on the demand for alcohol next winter.

A proposal submitted to the WPB by the SAE calls for:

1. Motorists to save last winter's permanent type anti-freeze, if the solution is worth saving.

2. Making sufficient quantity of permanent type anti-freeze available next winter to build up the solutions saved from last winter. This procedure, it is estimated, would require only 4 million gallons of ethylene glycol, against the need of 20 million gallons of alcohol if ethylene glycol is thrown out entirely.

The situation is of paramount interest to oil companies for many motorists look to oil industry service stations each autumn for cooling system conditioning service and anti-freeze solutions.

The industry's service stations have frequent contact with motorists and can urge motorists to save last winter's solutions against the possibility that make-up solution will be available. Both alcohol and ethylene glycol are critical materials and the reuse of last winter's permanent type solutions will save just that much material.

The SAE sprang into action as soon as the WPB order, L51, was issued. R. C. Sackett, secretary of the SAE War Engineering Board, called a special meeting of the board's Anti-Freeze Committee.

Conservation recommendations of the Committee, in brief, are to test permanent type anti-freeze solutions to determine if they are of sufficient strength to warrant saving. If solutions have further use, they should be preserved, by either being stored for the summer or kept in service in the car cooling system. Before returning the solution to service next autumn, it should be treated with a suitable inhibitor.

The Committee's recommendations and the facts relating to the savings possible in alcohol next winter if make-up permanent type anti-freeze is made available have been presented to the WPB. The recommendations have the backing of top-flight executives and engineers in the automobile, aircraft, farm tractor, accessory, and anti-freeze industries.

Cadillac Service Plan

Cadillac dealers are offering Cadillac owners a lubrication and inspection plan for service extending over a year, based on the time requirements of 35 m.p.h. driving speed. The plan, announced in a recent issue of *Automotive News,* offers Cadillac owners:

Three crankcase drains.
Six chassis lubrication jobs.
One transmission and differential drain.
One front wheel bearing lubrication job.
One engine pan cleaning job.
Three air cleaner inspections.
Two criss-crossing of tires.
Six battery recharges.

The inspections are on a 60-day interval basis, and six of these servicings will take care of the owner's requirements for a 12-month period.

Owners accepting the plan will be issued a booklet, and when services are completed a stub will be removed. George W. Otto, assistant general parts and service manager of Cadillac, announced that the plan was designed to fit the reduction in mileage under fuel rationing, by placing servicing on a time basis.

How to Service Universal Joints

"Several months ago Studebaker released universal joints equipped with fittings which permit lubrication of the joints without disassembly," states the Studebaker Service Bulletin.

"To make the lubrication fitting accessible each universal joint cross must be installed with the lubrication fitting pointing toward the drive shaft or center of the car.

"The clearance around the lubrication fitting is not sufficient to permit use of the high pressure gun usually found on grease racks. Besides, as no vent hole or relief valve is provided high pressure lubrication might endanger the seals between the crosses and cups. It is advisable therefore, to use only a hand gun in lubricating the joints."

SWAN-FINCH OIL CORP.

RCA Building 201 N. Wells St.
New York 20, N. Y. Chicago 6, Ill.

Manufacturers

Lubricating Oils — Greases
Foundry Core Oils

ALL GRADES OF GRAPHITE
FOR THE GREASE & OIL COMPOUNDER

EXCELLENCE D SINCE 1827

JOSEPH DIXON CRUCIBLE CO.
JERSEY CITY, N. J.

2661

ALEMITE

ALEMITE A EQUIPMENT

WORLD'S LARGEST PRODUCERS OF ALL TYPES OF LUBRICATION FITTINGS AND EQUIPMENT

—

STEWART-WARNER CORP.
1826 Diversey Parkway
Chicago

AUTOMOTIVE
AND LUBRICATING
GREASE SPECIALTIES
CUTTING FLUIDS
AND CORE OILS

PENOLA INC.
30 ROCKEFELLER PLAZA, NEW YORK, N. Y.

DOPP
positively-scraped
GREASE KETTLES
and
PRESSURE MIXERS
SOWERS MANUFACTURING CO.
1295 Niagara St. Buffalo, N. Y.

"Good Oil is essential to good grease"
DEEP ROCK
"G" Cylinder Stock
Dewaxed Bright Stocks
and Neutral Oils
DEEP ROCK OIL CORPORATION
155 N. Clark St. Chicago, Ill.

TRABON
Lubricating Equipment
•
Trabon Engineering Corporation
Cleveland, Ohio

Complete Packaging Service for
LITHOGRAPHED METAL AND GLASS CONTAINERS
GREASE • KEROSENE
LUBRICATING OILS • STEEL PAILS
OWENS-ILLINOIS GLASS COMPANY
OWENS-ILLINOIS CAN COMPANY
TOLEDO • OHIO

WOOL GREASES
(Degras)
Common — Neutral — Lanolin
For All Purposes
Refined by
N. I. MALMSTROM & CO.
BROOKLYN, N. Y.

Specialized Glycerides
and
FATTY ACIDS
for
Lubricating Greases
•
THE
WERNER G. SMITH CO.
(Division of Archer-Daniels-Midland Company)
2191 West 110th St., Cleveland, O.

Fats & Fatty Acids
For The
Grease Manufacturer

W. C. HARDESTY Co., Inc.
NEW YORK, N. Y.

GREASE & OIL PACKAGES
•
For the Grease & Oil Industry
•
J & L STEEL BARREL COMPANY
ST. LOUIS, MO.

A Complete Line of Oils...
FOR THE GREASE MANUFACTURER
CALUMET REFINING CO.
4323 S. Western Blvd. Chicago, Ill.
Refinery, Burnham, Ill.

Use Metasap Aluminum Stearate
Bases for Clear, Transparent
Water Insoluble Greases.
•
METASAP CHEMICAL COMPANY
HARRISON, NEW JERSEY

Chek-Chart
AUTOMOTIVE LUBRICATION ENCYCLOPEDIA
Recognized Headquarters
for
Authentic Automotive Information
The Chek-Chart Corporation
624 S. Michigan Ave. Chicago, Ill.

LUBRICATE FOR SAFETY EVERY 1000 MILES